

CHAPTER 3.0: WATER SUPPLY SYSTEM

3.1 CURRENT AND PLANNED WATER SUPPLIES

The Yorba Linda Water District currently has two sources of water supply:

- Lower Santa Ana Basin (Orange County Basin)
- Metropolitan Water District of Southern California (via Municipal Water District of Orange County)

Emergency interconnections to the City of Anaheim, City of Brea, and the GSWC are also available to YLWD in the event of a localized emergency.

3.1.1 Lower Santa Ana Basin

Historically, the Yorba Linda Water District has pumped approximately 50% of its total annual water supply from the Lower Santa Ana Basin through eight active groundwater wells. The basin is contained within the Orange County Groundwater Basin, which is managed by OCWD. In 1933 OCWD was formed by a special act of the California Legislature to manage Orange County's groundwater supply and protect the County's rights to water in the Santa Ana River. OCWD is responsible for managing the use, replenishment, and protection of Orange County's groundwater basin. A Basin Pumping Percentage (BPP) is set by OCWD that mandates the percentage of groundwater production to total water supply that each of its member agencies, including YLWD, is allowed to pump. In the five years preceding 2003 the BPP was set to allow member agencies to pump 75 percent of their total water supply from the Orange County Groundwater Basin. The BPP was lowered to 66 percent as of April 2003, and further lowered to 62 percent beginning in 2005 as a result of low groundwater levels, drought, and saltwater intrusion into the basin. Historically, YLWD has pumped below the BPP because its facilities are at maximum pumping capacity. Groundwater currently accounts for approximately 48 percent of the total water supply. Since groundwater is a less expensive source of supply than imported water, YLWD's goal is to maximize groundwater production to the available BPP by means of capital improvement projects to increase groundwater pumping capacity and distribution facilities.

3.1.2 Metropolitan Water District of Southern California (Via MWDOC)

The remainder of the water supply required to meet YLWD's demands is imported from Metropolitan via MWDOC. Metropolitan is the largest wholesale water agency in the United States, bringing imported water from the Colorado River via the Colorado River Aqueduct and from Northern California via the State Water Project, to a water service area that extends from Ventura to the California–Mexico border. MWDOC was organized to acquire imported water from Metropolitan and supply it to many agencies in Orange County.

MWDOC supplies treated water to YLWD via three connections with a combined capacity of 18,000 GPM through the Lower Feeder and Allen–McColloch Pipelines. Untreated water is also imported to Yorba Linda for irrigation purposes through one connection with a capacity of 4,500 GPM.

3.2 WATER SUPPLY PROJECTIONS

Projections of population and economic growth suggest that the YLWD customer base may reach a population of 85,355 within the next 25 years, which is a moderate 13 percent increase. The number of dwelling units is not expected to increase dramatically; however, the increase in family size and intensification of land use by both industry and commercial entities can be attributed to the slight increase.

Groundwater is expected to remain less expensive to produce than imported water in the future. The capacity of the current YLWD distribution system facilities is 26,404 AFY; therefore, the amount of groundwater YLWD can produce will be limited by the BPP established by OCWD, and the pumping capacity of YLWD facilities. Projections for future supply sources over the next 25 years are provided below. Annual groundwater extraction from the Orange County Basin by YLWD was projected by OCWD. The remainder of the water supply necessary to meet projected water demands will be imported from Metropolitan.

Table 3.2–1: Current And Planned Water Supplies (AFY)						
Water Supply Sources:	2005	2010	2015	2020	2025	2030
Metropolitan (via MWDOC)	12,987	11,280	12,394	12,694	12,619	12,546
Orange County Basin	11,644	14,759	14,444	14,623	14,919	15,134
Total	24,631	26,039	26,838	27,317	27,537	27,680

3.2.1 Projected Water Supply Source Percentages

The sources providing the projected water needs are estimated to change from 45 percent Orange County Basin and 55 percent Metropolitan (via MWDOC), to an average of 53 percent and 47 percent, respectively. Figure 3.2–1: Projected Water Supply Sources, details the supply source percentages over the next twenty–five years, in five–year increments.

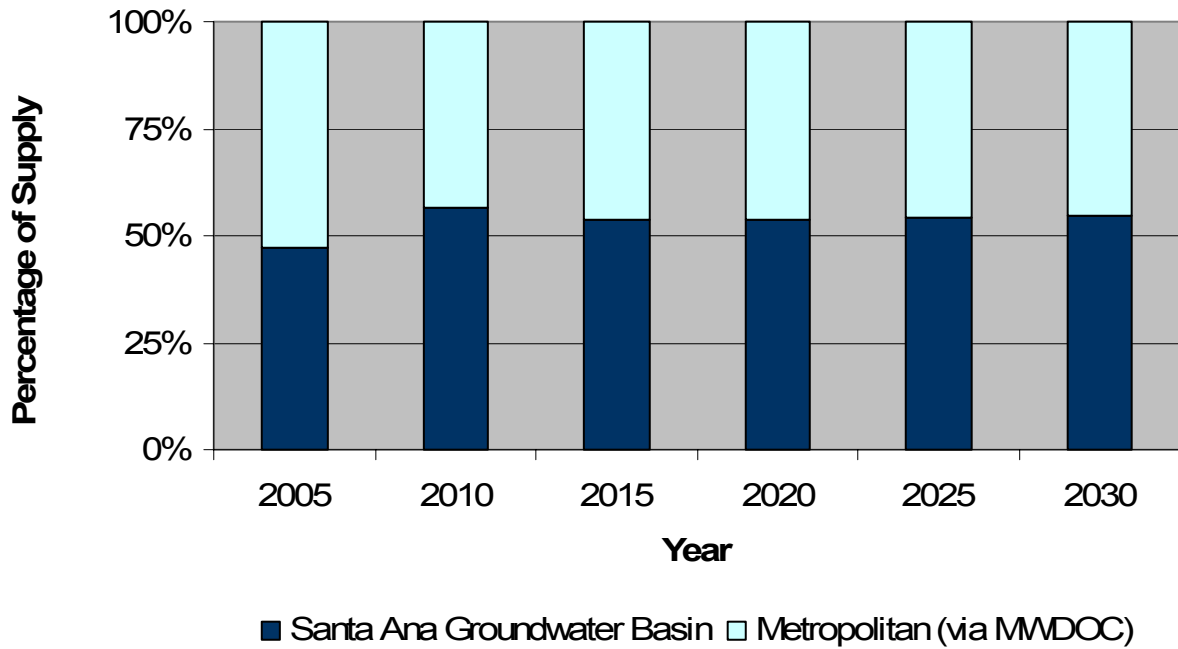


Figure 3.2-1: Projected Water Supply Sources

3.3 WATER SUPPLY HISTORY

The following table details Yorba Linda Water District water supply for the past ten years by source of supply:

Table 3.3–1: Historical Production by Source of Supply (AFY)			
Year	Orange County Basin	MWDOC	Total Production
1994	9,541	8,235	17,776
1995	10,007	8,036	18,043
1996	10,242	9,426	19,668
1997	10,010	10,858	20,868
1998	9166	8,994	18,160
1999	10,253	11,989	22,243
2000	10,812	11,169	21,980
2001	10,533	11,044	21,577
2002	10,091	13,366	23,457
2003	9354	13,286	22,640
2004	10,415	12,828	23,243
Average Annual Acre–Feet	10,039	10,839	20,878

3.3.1 Historical Water Supply Source Percentages

The historical water supply sources, from 1994 to 2004, have an average annual division of 48% from the Orange County Basin and 52% from the MWDOC. Table 3.3–2: Historical Water Supply Source Division and Figure 3.3–1: Historical Supply Sources detail the division of the water supply over the past ten years.

Table 3.3–2: Historical Water Supply Source Division (%)					
Water Supply Sources:	1994	1995	1996	1997	1998
Metropolitan (via MWD OC)	46%	45%	48%	52%	50%
Orange County Basin	54%	55%	52%	48%	50%

Table 3.3–2 (continued): Historical Water Supply Source Division (%)						
Water Supply Sources:	1999	2000	2001	2002	2003	2004
Metropolitan (via MWD OC)	54%	51%	51%	57%	59%	55%
Orange County Basin	46%	49%	49%	43%	41%	45%

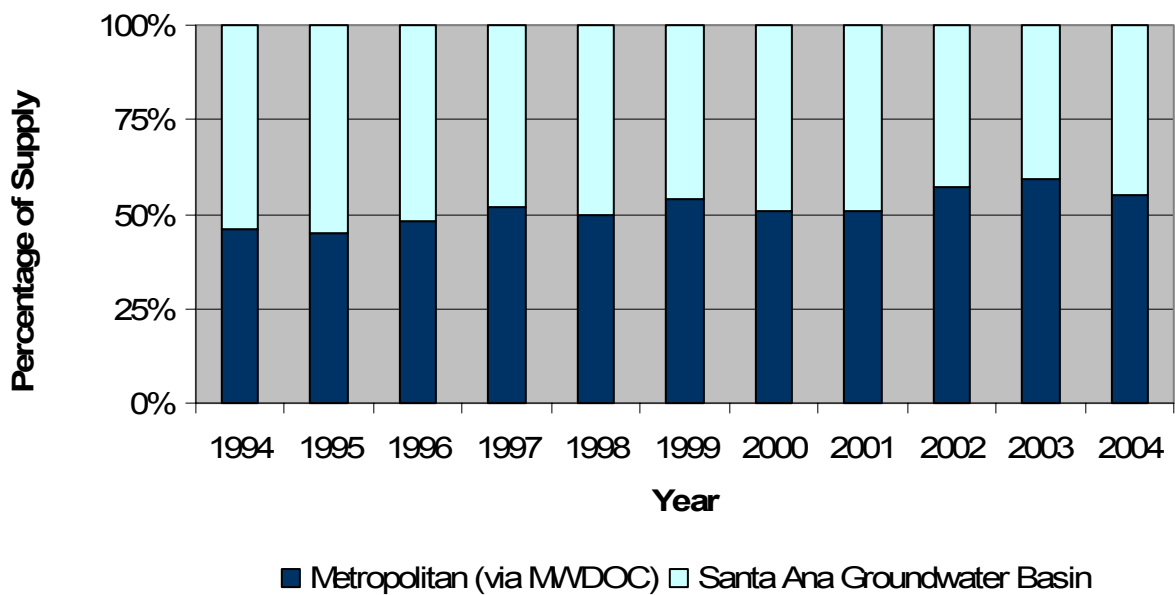


Figure 3.3–1: Historical Water Supply Sources

3.4 GROUNDWATER: ORANGE COUNTY BASIN

3.4.1 Lower Santa Ana River Basin Hydrogeology

This basin, also known as Orange County Groundwater Basin, underlies a coastal alluvial plain in the northwestern portion of Orange County. It covers an area of approximately 350 square miles beneath broad lowlands known as the Tustin and Downey Plains (Figure 3.4–1: Map of Orange County Groundwater Basin). The Basin is bounded by consolidated rocks exposed in the north in the Puente and Chino Hills, in the east in the Santa Ana Mountains, and in the south in the San Joaquin Hills. The Basin is bounded by the Pacific Ocean in the southwest and by the Orange County–Los Angeles County line in the northwest. The Basin underlines the lower Santa Ana River Watershed.

The Orange County Basin is dominated by a deep structural depression containing a thick accumulation of fresh water–bearing inter–bedded marine and continental sand, silt and clay deposits. The proportion of fine material generally increases toward the coast, dividing the Basin into forebay and pressure areas. Consequently, most surface water recharge is through the coarser, more interconnected and permeable forebay deposits. Layers in this Basin are faulted and folded, and may show rapid changes in grain size. The Newport–Inglewood fault zone parallels the coastline and generally forms a barrier to groundwater flow. Erosional channels filled with permeable alluvium break this barrier in selected locations called “Gaps”. In addition to this geologic feature, increased pumping from inland municipal wells causes the coastal gaps at Talbert, Bolsa, Sunset, and Alamos to be susceptible to seawater intrusion. The sediments containing easily recoverable fresh water extend to about 2,000 feet in depth near the center of the Basin. Although water–bearing aquifers exist below that level, water quality and pumping lift make these materials economically unviable at present. Upper, middle, and lower aquifer systems are recognized in the basin. The upper aquifer system, also known as the “shallow” aquifer system, includes Holocene alluvium, older alluvium, stream terraces, and the upper Pleistocene deposits represented by the La Habra Formation. It has an average thickness of about 200 to 300 feet and consists mostly of sand, gravel, and conglomerate with some silt and clay beds.

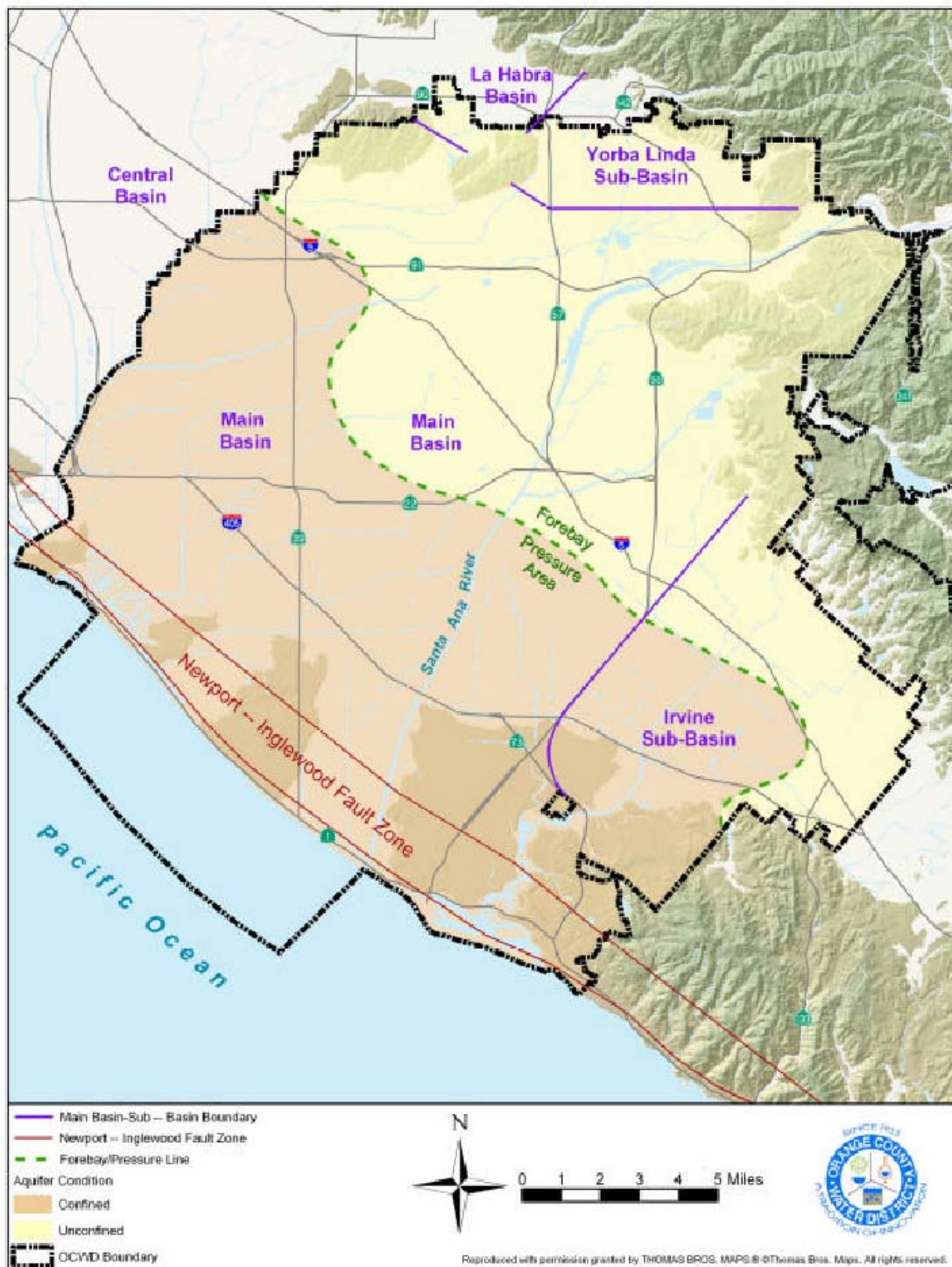


Figure 3.4–1: Map of the Orange County Groundwater Basin

Source: MWDOC 2005 UWMP

Generally, the upper aquifer system contains a lower percentage of water-bearing strata in the northwest and coastal portions of the area where clays and clayey silts dominate. Accordingly, recharge from the surface to the groundwater basin may be minor in these areas. Recharge to the upper aquifer system occurs primarily in the northeastern portions of the Basin. With the exception of a few large system municipal wells in the cities of Garden Grove, Anaheim, and Tustin, wells producing from the shallow aquifer system predominantly have industrial and agricultural uses. Production from the shallow aquifer system is typically about five percent of total Basin production. The middle aquifer system, also known as the “principal” aquifer system, includes the lower Pleistocene Coyote Hills and San Pedro Formations, which have an average thickness of 1,000 feet and are composed of sand, gravel, and a minor amount of clay. The primary recharge of the middle aquifer system is derived from the Santa Ana River channel in the northeast of the County. The middle aquifer system provides 90 to 95 percent of the groundwater for the Basin. The lower aquifer system (or deep aquifer) includes the Upper Fernando Group of upper Pliocene age and is composed of sand and conglomerate 350 to 500 feet thick. Electric logs of this aquifer indicate that it would probably yield large quantities of fresh water to wells, but this zone has been found to contain colored water, and the aquifer is too deep to economically construct production wells. With the exception of four colored water production wells constructed by Mesa Consolidated Water District (MCWD) and Irvine Ranch Water District (IRWD), few wells penetrate the deep aquifer system. Figure 3.4–2: Geologic Cross Section through Orange County Groundwater Basin presents a geologic cross-section through the Basin along the Santa Ana River.

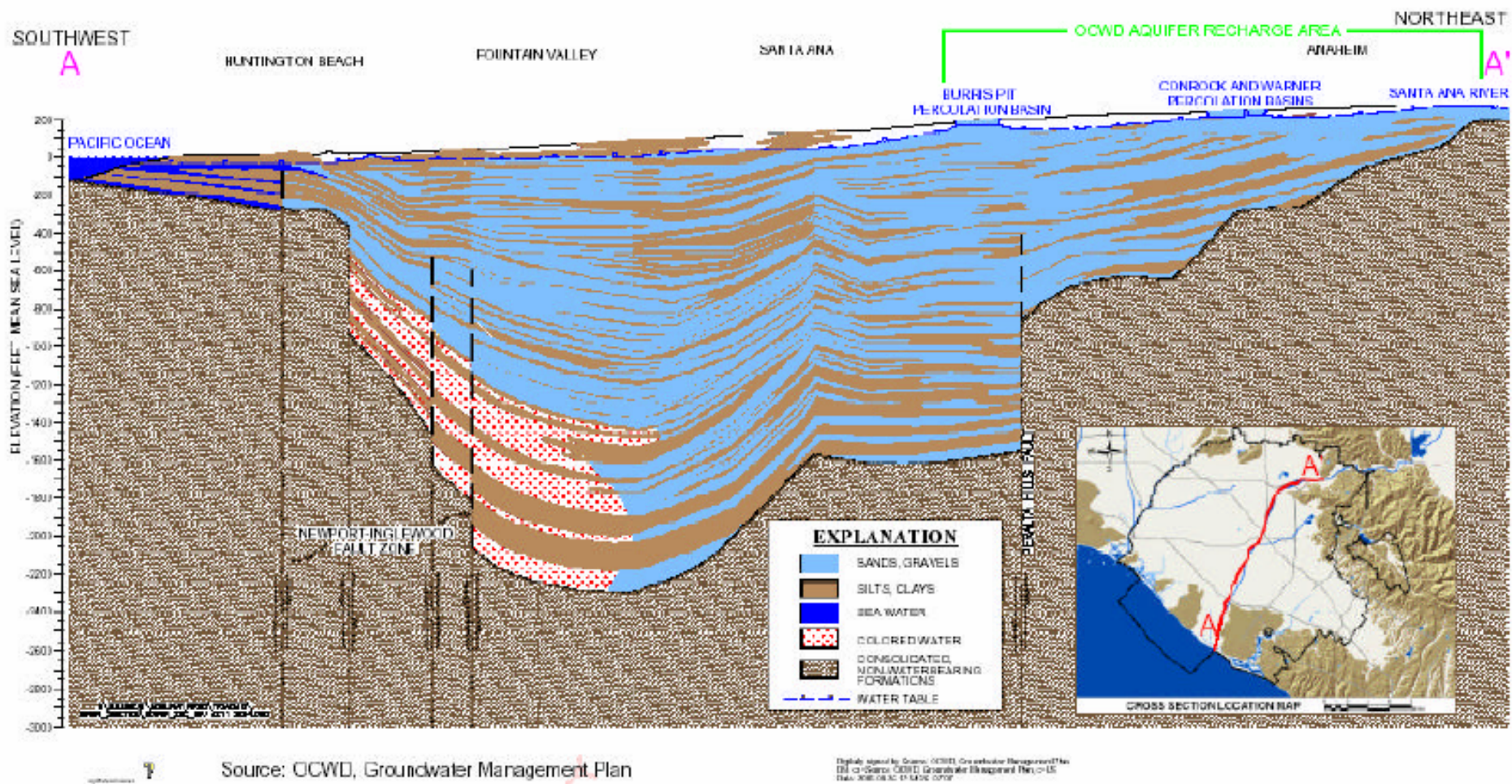


Figure 3.4–2: Geologic Cross Section through Orange County Groundwater Basin

Source: OCWD Groundwater Management Plan

3.4.2 Basin Groundwater Production Management

OCWD manages the Orange County Basin. Since OCWD was formed in 1933, the Basin has played a key role in meeting the water supply needs of north Orange County. For the past 50 years, OCWD has implemented a management policy to provide for uniformity of cost and access to Basin supplies without respect to how long an entity has been producing from the Basin.

Historically, OCWD managed the Basin based upon seeking to increase supply rather than restricting demand. Because the Basin is not operated on an annual safe-yield basis, the net change in storage in any given year may be positive or negative; however, over the long term, the Basin must be maintained in an approximate balance to ensure the long-term viability of Basin supplies. While no pumping restrictions exist, OCWD manages the amount of production through financial incentives. The framework for the financial incentives is based on establishing the Basin Production Percentage (BPP). The BPP is the ratio of groundwater production to total water demands, expressed as a percentage. Pumping below the BPP is charged an assessment on a per acre-foot basis. This assessment is called the Replenishment Assessment (RA). Groundwater production above the BPP is charged the RA and the Basin Equity Assessment (BEA), which is typically set so that the cost of groundwater production above the BPP is similar to the cost of purchasing alternative supplies. OCWD's general goal is to maintain the BPP as high as possible without negatively impacting the basin to allow producers to maximize their groundwater production, thereby lowering their overall water supply cost. Until recently, the actual BPP has sometimes been approximately five percent lower than the allowable BPP. This is primarily due to YLWD, Irvine Ranch Water District, and the City of Buena Park, which have been unable to pump up to the BPP.

Increasing accumulated overdraft of the Basin since the late-1990s has prompted increased evaluation of the Basin's yield and how the yield can be optimized through projects and programs. As a response to various factors, including a series of years with below-average precipitation and the increased accumulated overdraft, in 2003 OCWD reduced the BPP to decrease pumping from the Basin. This was the first BPP reduction since 1993.

3.4.3 Extraction Rate, Groundwater Recharge, and Expected Yield

Total groundwater production has approximately doubled since 1954. Groundwater consumption from the Orange County Basin has increased from 150,000 acre-feet per year to a maximum of 384,000 acre-feet per year. Currently, groundwater is produced from approximately 500 active wells within the Basin, approximately 300 of which produce less than

25 acre–feet per year. Well yields range from 500 to 4,500 gallons per minute, but are generally 2,000 to 3,000 gallons per minute. Groundwater production from approximately 200 large–capacity or large system wells operated by the 21 largest water retail agencies accounted for an estimated 97 percent of the total production. All but three of these large retail agencies, the Cities of Anaheim, Fullerton, and Santa Ana, are within the MWDOC service area. Groundwater production is generally distributed uniformly throughout the majority of the Basin with the exceptions of the Irvine and Yorba Linda sub–basins, the immediate coastal areas, and the foothill margins of the Basin, where little to no production occurs.

Since YLWD has been unable to pump up to the BPP, several major capital improvement projects have been completed to improve reliability and increase groundwater pumping capacity. In 1992, two important facilities were constructed which allowed YLWD to increase groundwater production. One facility was the Palm Avenue Booster Pump Station, and the other was a transmission pipeline in Esperanza Road that moves groundwater into Zone 570 (2) in ID No. 1. In 1998, YLWD completed the Richfield Plant Phase I Improvements, which included upgrading the well pumping facilities for conversion from a double lift to single lift operation, and providing a chlorine facility for disinfection of the well water supply. In 2001, YLWD completed construction of the Zone 1 (Zone 428) transmission main, which supplies groundwater from the Richfield well field directly to Highland Reservoir (which gravity feeds Zone 428 (1A) through a dedicated transmission pipeline with turnouts.

The ability of YLWD to increase groundwater pumping and transmission is limited until additional distribution facilities are complete. Several recently completed and upcoming improvement projects will enhance groundwater pumping and transmission capabilities. These projects and their current status are:

- Well No. 18 Pumping Facilities (completed 2004).
- Well No. 15 Discharge Pipeline (completed 2004).
- Zone 3 (Zone 675) Transmission Pipeline in Bastanchury Road west of Lakeview Avenue to Valley View Reservoir (completed 2004).
- Zone 3 (Zone 675) Transmission Pipeline in Bastanchury Road from Lakeview Avenue east to Fairmont Boulevard (completed through to Pulte Development 2004).
- Zone 3 (Zone 675) Transmission Pipeline in Bastanchury Road through Shapell Development (design phase 2005).
- Highland Pump Station Expansion (completed 2005).
- Bastanchury Pump Station Expansion (design phase).

- Zone 2 (Zone 570) Transmission Pipeline (construction phase 2005).
- Palm Avenue Pump Station (Zone 570 (2) to Zone 675 (3)) Expansion (design phase).

The completion of these projects will increase coastal production and possibly lead to increased stress on the Talbert and Alamitos Barriers, requiring additional barrier capacity.

The Basin is recharged by multiple sources. These include artificial, i.e., man-made systems, and incidental or natural recharge. One of OCWD's core activities is refilling or replenishing the Basin to balance the removal of groundwater by pumping. OCWD currently owns and operates more than 1,000 acres of recharge facilities in and adjacent to the Santa Ana River (SAR) and Santiago Creek. The four main systems of the percolation program consist of 17 major facilities. Percolation rates tend to decrease with time as the spreading basins develop a thin clogging layer from fine-grained sediment deposition and from biological growth. Historical groundwater flow was generally toward the ocean in the southwest, but modern pumping has caused groundwater levels to drop below sea level inland of the Newport–Inglewood fault zone. This trough-shaped depression encourages sea water to migrate inland, which if unchecked, could contaminate the groundwater supply. Strategic lines of wells in the Alamitos and Talbert Gaps inject imported and reclaimed water to create a mound of water seaward of the pumping trough to protect the Basin from seawater intrusion. In addition to operating the percolation system, OCWD also operates the Talbert Barrier in Fountain Valley and Huntington Beach, and participates in the financing operation of the Alamitos Barrier in Seal Beach and Long Beach. The barriers help prevent seawater intrusion and also help refill the Basin.

Sources of recharge water include SAR baseflow and storm flow, Santiago Creek Flows, imported supplies purchased from Metropolitan, supplemental supplies from the upper SAR Watershed, and purified water “injected” from recycling plants. Figure 3.4–3: Historical Groundwater Replenishment and Production shows the historical amount of replenishment with respect to production.

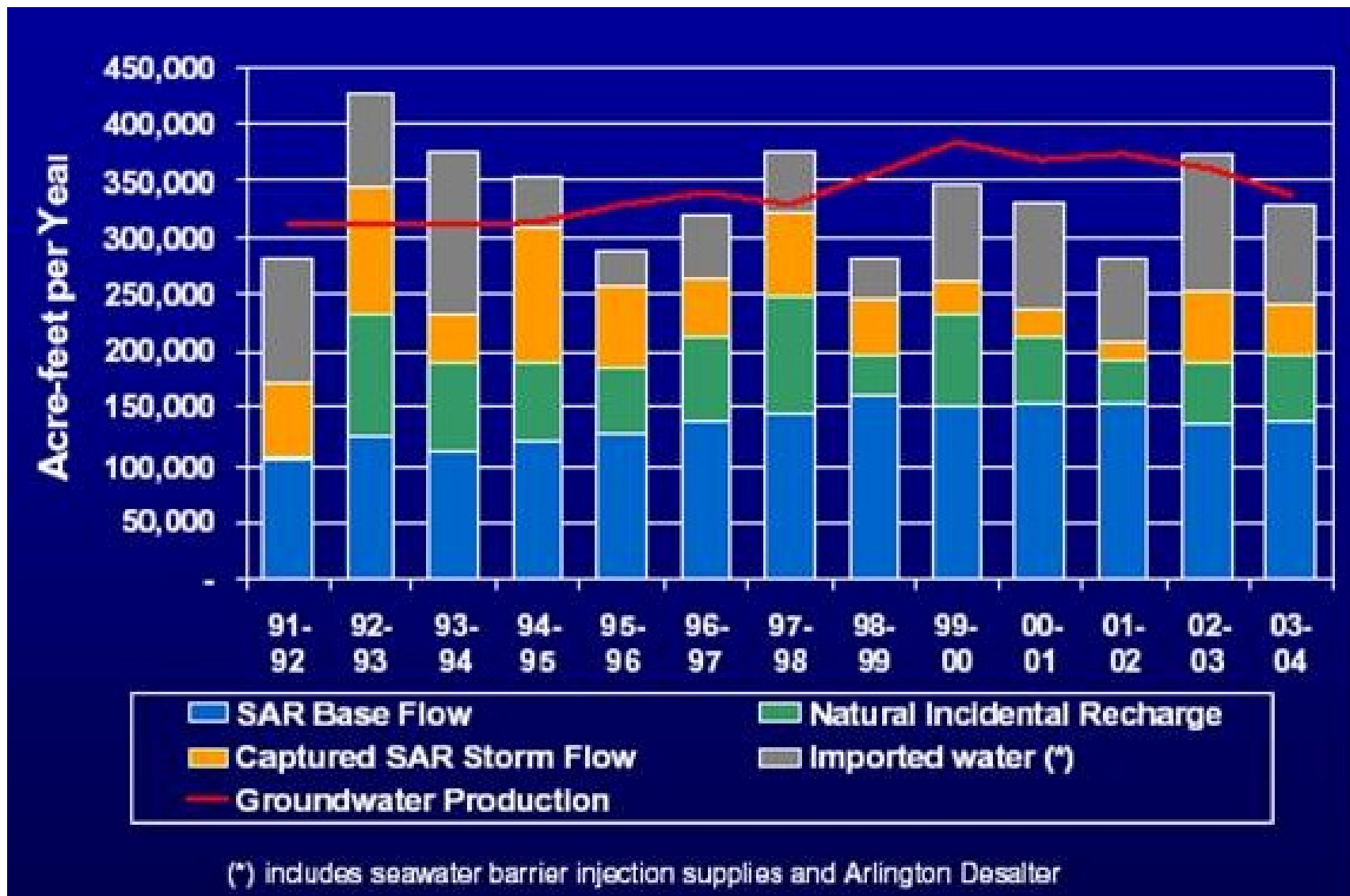


Figure 3.4-3: Historical Groundwater Replenishment and Production

Source: Orange County Water District

3.4.3.1 Santa Ana River Baseflow

The primary source of replenishment for the basin is SAR flows. SAR flows below Prado Dam consist of a perennial baseflow component and a seasonal stormflow component. The majority of baseflow is composed of tertiary-treated wastewater discharges from wastewater treatment facilities upstream of Prado Dam. Future estimated increases in population in the upper SAR Watershed will result in baseflow increases. Since the 1970s, SAR baseflow has increased with additional runoff and treated wastewater discharges from the establishment of upstream residential communities. Baseflow increases are a replenishment source to the Basin. Reclamation programs, water conservation, and regulatory requirements could affect the amount of wastewater discharged into the SAR. While upstream urbanization and population growth would increase SAR baseflow, reclamation programs in the upper SAR Watershed could reduce SAR baseflows and impact the amount of water captured and spread in Orange County. According to a study performed by the Santa Ana Watershed Project Authority (SAWPA) in March 2004 based on the projected level of growth and reclamation at the upper SAR Watershed, baseflow is estimated to increase from 145,000 acre-feet per year at present time to 190,000 acre-feet per year in 2025.

3.4.3.2 Santa Ana River Stormflow

The volume of groundwater replenished from SAR stormflows is a function of precipitation intensity, duration, impervious area, and distribution over a given year. Although stormflows average approximately 33 percent of the total SAR flows, they average a lower percentage of the total water recharged at OCWD's spreading facilities. This is primarily because the magnitude of stormflow releases from Prado Dam often greatly exceeds the percolation capacity of the spreading basins. The maximum flow from storm runoff can reach above 400,000 acre-feet per year. However, according to OCWD's recharge records, the maximum annual amount of storm flow recharge between 1963 to 1964 and 2002 to 2003 was 117,000 acre-feet and the minimum was 16,000 acre-feet.

3.4.3.3 Incidental Recharge

This natural recharge to the Basin occurs from local mountain –front recharge, precipitation and irrigation water infiltration, and groundwater underflow to/from Los Angeles County and the ocean. For the most part, natural incidental recharge occurs outside the OCWD's control. Net incidental recharge refers to the net amount of incidental recharge that occurs after accounting for subsurface outflow to Los Angeles County. Groundwater outflow from the basin across the Los Angeles/Orange County line has been estimated to range from approximately 1,000 to 14,000 acre-feet per year based on groundwater elevation gradients and aquifer transmissivity.

Underflow varies annually and seasonally depending upon hydrologic conditions on both sides of the county line. Modeling by OCWD indicates that, assuming groundwater elevations in the Central Basin remain constant, underflow to Los Angeles County increases approximately 8,500 acre–feet per year for every 100,000 acre–feet of increased groundwater in storage in Orange County between 500,000 to zero accumulated overdraft.

3.4.3.4 Recycled Water

In 1975, OCWD built a treatment plant called “Water Factory 21” that purified up to approximately 15 MGD of clarified secondary wastewater effluent using lime clarification pretreatment, multi–media filtration, and reverse osmosis (RO). Recently, ultraviolet light (UV) treatment was added. Water Factory 21 was replaced in 2004 with the first 5 MGD phase of the GWR System. The GWR System is jointly sponsored by OCWD and the Orange County Sanitation District (OCSD). The first phase of the GWR System will increase the reliability and sustainability of local groundwater supplies through the creation of a new source of water, producing a total of 72,000 acre–feet per year for groundwater recharge. The GWR System will be operational in mid–2007. The GWR System will augment existing groundwater supplies through indirect potable reuse, providing a reliable, high–quality source of recharge water for the basin. Additionally, direct injection of project water into the Talbert Barrier will protect the coastal aquifer from seawater intrusion. The GWR System consists of three major components: Advanced Water Treatment (AWT) facilities and pumping stations, a pipeline connection from the treatment facilities to existing recharge basins, and expansion of the Talbert Barrier. The heart of the GWR System is the advanced water purification plant, which purifies the water with microfiltration (MF), Reverse Osmosis (RO), and advanced oxidation processes (AOP), which consist of UV and hydrogen peroxide. Following filter screening, OCSD–clarified secondary effluent, normally disposed to the ocean, receives MF membrane treatment. MF is a low–pressure membrane process that removes suspended matter from water. MF filtrate will be fed to RO, and MF reject streams will be returned to OCSD’s Plant No.1 for disposal. The RO process will reject dissolved contaminants and minerals. Particularly, RO treatment will reduce dissolved organics, pesticides, TDS, silica, and viruses from MF filtrate. The RO concentrate will be discharged into the ocean via the existing OCSD ocean outfall. Following RO, the water will undergo UV along with hydrogen peroxide treatment. UV treatment involves the use of UV light to penetrate cell walls of microorganisms, preventing replication and often inducing cell death. UV thus provides an additional barrier of protection against bacterial and viral organisms and, combined with RO treatment, increases removal efficiency. More importantly, UV with hydrogen peroxide oxidizes many organic compounds for ultimate removal from water. After RO treatment, the product water is so low in mineral content that it has a corrosive nature,

which can be mitigated with the addition of lime. If lime addition did not take place, the concrete transmission pipe would corrode in the presence of the unstabilized water. The GWR System will provide roughly 38,000 acre–feet per year for recharge in Kraemer Basin and 34,000 acre–feet per year of injection water to Talbert Barrier. Up to 2,000 acre–feet per year of purified water will be used for injection to Alamitos Barrier. This purified water is produced by a plant constructed by the Water Replenishment District of Southern California. OCWD purchases purified water from this plant for Injection into the Alamitos Barrier.

3.4.3.5 Imported Water from Metropolitan

Metropolitan sells groundwater replenishment water to OCWD when surplus water is available. This water is delivered via the in–lieu program or by direct spreading. OCWD is able to increase allowable pumping from the groundwater basin, above the natural safe yield, with the purchase of replenishment water. Delivery of replenishment water is interruptible and is frequently turned off throughout the year depending upon firm demands on available delivery and treatment capacity in the Metropolitan system. When surplus replenishment water is unavailable for extended periods, OCWD continues to allow pumping above the groundwater basin’s natural safe yield. Under this operation, the Orange County Basin would draw on stored water to sustain this level of pumping. Depending on the severity of the drought and local supply conditions, this operation can be sustained for 2 to 3 years before the Basin reaches significant overdraft. OCWD must then refill the basin when the replenishment supply becomes available from Metropolitan. This close coordination of the Basin’s operation with the Metropolitan replenishment program benefits the local service area with enhanced pumping levels in normal and wet years, and the entire region by storing surplus water that can be produced via sustained pumping during times of tighter supply availability. Metropolitan also sells treated non–interruptible water to OCWD for injection into the Talbert Seawater Barrier. This water assists in the protection of the Basin from seawater intrusion. Direct replenishment water is received at OCWD’s recharge facilities in the cities of Anaheim and Orange and is physically recharged into the Basin through percolation. In–lieu supplies are physically recharged into the Basin when participating producers turn off their wells and receive excess Metropolitan water in–lieu of pumping groundwater. This reduces the amount of water taken from the Basin. Injection water into Talbert Barrier has been supplied by potable water purchased from Metropolitan since 2002. It is anticipated that potable Metropolitan water will be used to make up a portion of the injection water at the Talbert Barrier until about 2009, when the second year of operation of the GWR System is complete. After this time, the GWR System should provide all of the water injected into the Talbert Barrier.

3.4.3.6 Arlington Desalter

When potable consumption does not match the output of the Arlington Desalter in Riverside, OCWD purchases the excess water for groundwater recharge. Water from this project flows to the OCWD recharge facilities through the Santa Ana River. It is projected that approximately 2,000 acre–feet per year of water is available for OCWD recharge facilities.

3.4.4 Historical Santa Ana Groundwater Basin Extraction

Table 3.4–1 details the history of the water extracted from the Santa Ana Groundwater Basin.

Table 3.4–1: Historical Groundwater Extraction	
Year	Acre–Feet
1994	9,541
1995	10,007
1996	10,242
1997	10,010
1998	9,166
1999	10,253
2000	10,812
2001	10,533
2002	10,091
2003	9,354
2004	10,415

3.5 MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

In the 1920s, three cities in Orange County (Anaheim, Fullerton, and Santa Ana), along with ten cities in Los Angeles County (Los Angeles, Long Beach, Santa Monica, Burbank, Glendale, Pasadena, San Fernando, Compton, Beverly Hills, and Torrance) formed the Metropolitan.

In 1951 MWDOC was formed by Orange County voters for the purpose of annexing to Metropolitan in order to acquire supplemental water supplies. The acquisition of additional water supplies was necessary for the continued economic growth of these cities. Subsequent annexations to MWDOC have brought the total population within the agency to approximately 82 percent of the County's total population.

MWDOC is the billing agent between Metropolitan and YLWD, as well as other local water retail agencies in Orange County. MWDOC also represents its member agencies in negotiations with Metropolitan, disseminates information to the retail agencies, and coordinates a regional public information and school education program.

Thirty member agencies, including the Yorba Linda Water District, purchase imported water from MWDOC for municipal, industrial, agricultural, and groundwater replenishment purposes.

Table 3.5–1: MWDOC Member Agencies

City of Brea	El Toro Water District
City of Buena Park	City of San Clemente
City of Fountain Valley	Irvine Ranch Water District
City of Garden Grove	Laguna Beach County Water District
City of Huntington Beach	Mesa Consolidated Water District
City of La Habra	Moulton Niguel Water District
City of La Palma	Orange County Water District
City of Orange	Santa Margarita Water District
City of Seal Beach	Santiago County Water District
City of Tustin	Golden State Water Company
City of Westminster	Trabuco Canyon Water District
City of Newport Beach	Yorba Linda Water District
City of San Juan Capistrano	Emerald Bay Service District
East Orange County Water District	Orange Park Acres Mutual Water Company
South Coast Water District	Serrano Water District

3.5.1 Historical Municipal Water District of Orange County Water Purchases

The following table details the history of the water purchased from Metropolitan via MWDOC.

Table 3.5–2: Historical MWDOC Water Purchases	
Year	Purchased Water (Acre–Feet)
1994	8,235
1995	8,036
1996	9,426
1997	10,858
1998	8,994
1999	11,989
2000	11,169
2001	11,044
2002	13,366
2003	13,286
2004	12,828

3.6 RELIABILITY OF SUPPLY

The Yorba Linda Water District depends on groundwater wells and imported water from Metropolitan to provide water to the entire service area. Within the service area, certain pressure zones may be dependent on the operation of booster pump stations to deliver water to that particular zone. If one of these sources of supply were out of service for an extended time, YLWD would have to rely on the alternate supply source and the emergency interconnections with neighboring water agencies.

In general, water imported from Metropolitan is a very reliable source of supply. However, it is possible to have an interruption in service for an extended period. It is typical for a water agency to plan for a 7 to 10 day loss of service from Metropolitan. The use of three connections to import water from YLWD to Metropolitan reduces the probability of a loss of water supply by reducing the probability that all connections will be out of service at the same time. In the event that all three connections fail simultaneously, operation of booster stations may be critical because some pressure zones do not have alternative supply or pumping sources within the zone.

The operation of YLWD's groundwater wells and booster pump stations is dependent on the energy source. Backup sources of energy such as propane tanks, emergency generators, and natural gas supplies, are available at many of YLWD's facilities. These alternative energy sources improve the reliability of YLWD's water supply. Additionally, the existence of multiple wells within YLWD's facilities creates redundancy and reduces the likelihood that all wells will be out of service simultaneously.

The regional water purveyor is implementing water supply alternative strategies for the region and on behalf of YLWD to ensure available water in the future. These strategies are identified in the Metropolitan and MWDOC 2005 Regional UWMP. The optimum water supply strategy should attempt to meet the following objectives:

- Ensure that water is available for residents and businesses in the future,
- Minimize the consumers water supply cost,
- Use a variety of sources, and
- Provide flexibility to quickly take advantage of changing and new markets, if and when they develop.

3.6.1 Basis of Water Year Data

According to the Department of Water Resources Guidebook, water years are defined by the pattern and level of annual runoff for each watershed from which a supplier receives supplies. Since Yorba Linda receives its water supply both locally (from the Santa Ana Groundwater Basin) and remotely (from Metropolitan), water years based on the historical hydrology of both regions were evaluated. Supply reliability projections were calculated by comparing the historical hydrology for both regions with current and projected water demands. The set that yielded the most conservative projections was used.

Approximately 48 percent of YLWD's water supply is obtained locally (Orange County Basin). Thus, the hydrology of the region encompassing the groundwater basin was researched to determine the regional water year basis. The research determined that the single-driest hydrologic year occurred in 1961, with 1959 to 1961 being the multiple-driest hydrologic years to date. The normal water year data was calculated as an average of historical regional hydrology from 1922 to 2004.

In addition, 52 percent of YLWD's supply is imported from Metropolitan, which determines water year data based on the hydrologic history of the State Water Project and the Colorado River Aqueduct regions. Metropolitan determined that the single-driest hydrologic year occurred in 1977, with 1990 to 1992 being the multiple-driest hydrologic years to date. The normal water year data was calculated as an average of the historical hydrology of the State Water Project and the Colorado River Aqueduct from 1922 to 2004.

The data used in this UWMP is based on the local hydrology since the driest hydrologic condition is derived from the local region and yields a more conservative projection.

Table 3.6–1: Basis of Water Year Data			
Water Year Type			
Normal Water Year	Average of Historical Hydrology from 1922 to 2004		
Single–Dry Water Year	1961		
Multiple–Dry Water Years	1959	1960	1961

3.6.2 Supply Reliability Analysis

The following tables evaluate the reliability of the water supply during normal, single-dry, and multiple dry water years. The analysis indicates that the reliability of the Orange County Basin is less than 100 percent. The reduced reliability of the Orange County Basin during dry years reflects low groundwater levels as a result of drought, saltwater intrusion, and increased accumulated overdraft of the Basin. To counteract the intermittent supply from the Orange County Basin during multiple dry water years, wholesale supply reliability is over 100 percent, which seems counterintuitive in dry water years. However, this supply reliability is attributed to additional reserves that the Metropolitan Water District of Southern California will utilize to supplement normal sources of supply during dry years.

Table 3.6–2: Supply Reliability: 2005 – 2010 (AFY)					
2005–2010	Normal Water Year	Single Dry Year (1961)	Multiple Dry Water Years		
			Year 1 (1959)	Year 2 (1960)	Year 3 (1961)
Orange County Basin	14,759	14,682	15,709	15,052	14,682
	% of Normal	99.5%	106.4%	102.0%	99.5%
MWDOC	11,280	12,807	11,520	11,721	12,807
	% of Normal	113.5%	102.1%	103.9%	113.5%

Table 3.6–3: Supply Reliability: 2010 – 2015 (AFY)					
2010–2015	Normal Water Year	Single Dry Year (1961)	Multiple Dry Water Years		
			Year 1 (1959)	Year 2 (1960)	Year 3 (1961)
Orange County Basin	14,444	13,239	13,612	13,053	13,239
	% of Normal	91.7%	94.2%	90.4%	91.7%
MWDOC	12,394	15,094	14,709	14,646	15,094
	% of Normal	121.8%	118.7%	118.2%	121.8%

Table 3.6–4: Supply Reliability: 2015 – 2020 (AFY)					
2015–2020	Normal Water Year	Single Dry Year (1961)	Multiple Dry Water Years		
			Year 1 (1959)	Year 2 (1960)	Year 3 (1961)
Orange County Basin	14,623	13,128	13,381	12,856	13,128
	% of Normal	89.8%	91.5%	87.9%	89.8%
MWDOC	12,694	15,709	15,584	15,402	15,709
	% of Normal	123.8%	122.8%	121.3%	123.8%

Table 3.6–5: Supply Reliability: 2020 – 2025 (AFY)					
2020–2025	Normal Water Year	Single Dry Year (1961)	Multiple Dry Water Years		
			Year 1 (1959)	Year 2 (1960)	Year 3 (1961)
Orange County Basin	14,919	13,224	14,047	12,923	13,224
	% of Normal	88.6%	94.2%	86.6%	88.6%
MWDOC	12,619	15,847	15,249	15,599	15,847
	% of Normal	125.6%	120.8%	123.6%	125.6%

Table 3.6–6: Supply Reliability: 2025 – 2030 (AFY)					
2025–2030	Normal Water Year	Single Dry Year (1961)	Multiple Dry Water Years		
			Year 1 (1959)	Year 2 (1960)	Year 3 (1961)
Orange County Basin	15,134	13,604	14,708	13,261	13,604
	% of Normal	89.9%	97.2%	87.6%	89.9%
MWDOC	12,546	15,617	14,779	15,432	15,617
	% of Normal	124.5%	117.8%	123.0%	124.5%

3.7 SUPPLY INCONSISTENCY FACTORS

The following table summarizes the factors that result in the inconsistency of each source of YLWD's water supply.

Table 3.7–1: Factors Resulting In Inconsistency Of Supply				
Name of supply	Legal	Environmental	Water Quality	Climatic
Metropolitan Water District of Southern California				x
Santa Ana Groundwater Basin				x

3.7.1 Climatic Factors

Climate data in California have been recorded since 1858, and data for Yorba Linda has been recorded since 1913. During the intervening years, California has experienced three periods of severe drought: 1924 to 1934; 1976 and 1977; and, 1987 to 1992.

Southern California and, in particular, Orange County sustained few adverse impacts from the 1976–1977 drought due in large part to the availability of Colorado River supply and groundwater stored in the lower Orange County Basin. The 1987–1992 drought period created more concern for Southern California and Orange County. In addition to the higher demands created by lower local rainfall, three factors contributed to the concern:

1. Users of the State Water Project (SWP) have increased their demand for project water, while little has been done for ten years to increase the delivery capacity. The result was a higher level of cutback on the SWP water for all classes of users.
2. The Central Arizona Project (CAP) has begun to divert sufficiently large quantities of water from the Colorado River so as to reduce water availability to Metropolitan. In 1989–1990 Metropolitan supply planning was based upon CAP diversions, which would have reduced Metropolitan's supply by 350,000 acre–feet. As the year progressed, heavy summer rainfall in Arizona reduced the CAP demand so that no reduction occurred.

3. Given recent legal decisions concerning supply from the Owens Valley and Mono Basin area, firm deliveries from the Owens Valley Aqueduct are reduced to the City of Los Angeles. To substitute for that shortage, the City of Los Angeles increased deliveries from Metropolitan by about 300,000 acre–feet per year.

The cumulative effect of the first three years of the 1987–1992 drought left the reserve storage in the SWP reservoirs very low. Metropolitan planning for the year contemplated just enough water availability to meet estimated demand. Local groundwater supplies were able to make up for reduced Metropolitan supply; however, improvements to the YLWD water transmission facilities will enhance the distribution of larger quantities of groundwater from the point of production into the eastern portion of the service area.

Yorba Linda Water District is vulnerable to water shortages during interval periods of drought due to its climatic environment and seasonally hot summer months. Response to a future drought would follow the water use efficiency mandates of MWDOC and its support of the Metropolitan WSDM Plan, along with implementation of YLWD's Water Shortage Contingency Plan (Chapter 8).

3.8 TRANSFER AND EXCHANGE OPPORTUNITIES

3.8.1 Inter-county Transfers

Southern California has generally been creative in its use of water transfers and exchanges. This condition grew out of the necessity that so much of its supply comes from hundreds of miles away. Details of these major water transfers and the innovative water exchanges are included in Plans adopted by MWDOC and Metropolitan.

3.8.2 Intra-county Transfers

Within Orange County, water exchanges and transfers are often used for emergency situations. Given that Orange County relies on imported water to meet the majority of its needs, there is no excess of local water to be permanently exchanged or transferred to meet future needs. The potential use of the lower Orange County Basin, managed by OCWD, has been under discussion for years as an emergency supply to the non-basin areas in time of need. Legal, institutional, and financial considerations preclude a formal agreement for such use at this time.

Each year MWDOC tabulates the projected demands for each agency five years into the future and, through the use of hydraulic model of the imported water distribution system, determines whether sufficient transmission capacity exists to meet local needs. MWDOC then distributes this information throughout the County to facilitate regional and local planning efforts.

It is important to note that as an arid area, depending on imported water for about 60 percent of its total supply, Orange County offers only limited opportunities for county-wide water exchanges and transfers.

3.8.3 Interagency Transfers

Locally, YLWD has ten (10) interconnections with its neighboring agencies. These interconnections allow the sharing of supplies during short term emergency situations or during planned shutdowns of the major import systems. Table 3.8–1: Emergency Interconnections identifies the interagency connections between the YLWD and its neighboring agencies:

Table 3.8–1: Emergency Interconnections

Agency	Location	Other Agency HGL (ft–MSL)	YLWD Pressure Zone	Size
City of Brea	Tolbert Avenue	605	570 (2)	8-inch
City of Brea	Vesuvius Drive	605	570 (2)	8-inch
City of Anaheim (#12)	Fairbury Lane	555	570 (2)	12-inch
City of Anaheim (#14)	Willow Woods Drive	445	430 (1B)	8-inch
City of Anaheim (#15)	Crystal Drive	555	570 (2)	16-inch
GSWC–Yorba Linda System	Rifle Range Road	714	780–3 (4C)	8-inch
GSWC–Yorba Linda System	Crestknoll Drive	693	675 (3A)	8-inch
GSWC–Yorba Linda System	Burleigh Avenue	714	675 (3A)	8-inch
GSWC–Placentia System	Lemke Drive	529	570 (2)	6-inch
GSWC–Placentia System	Maria Avenue	529	428 (1A)	6-inch